

# HY-8 Culvert Analysis Report

## Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 36.57 cfs

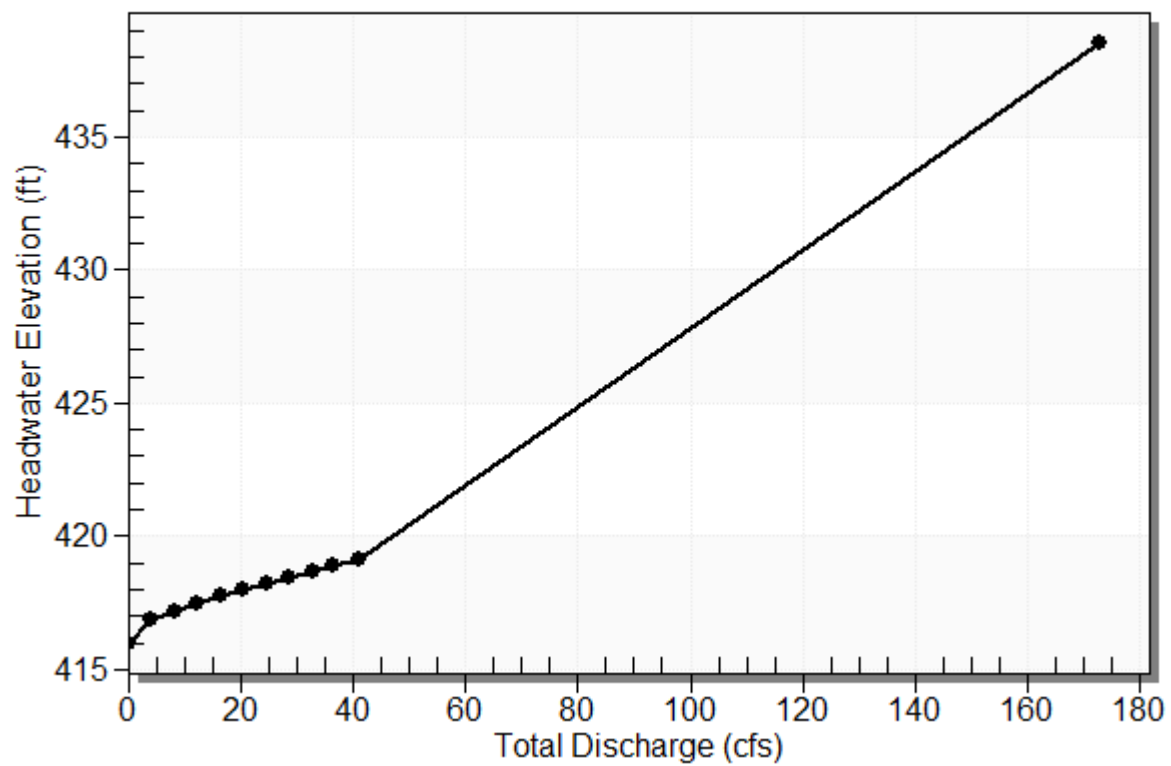
Maximum Flow: 41.02 cfs

**Table 1 - Summary of Culvert Flows at Crossing: Crossing 43 downstream**

Headwater Elevation (ft)	Total Discharge (cfs)	Rt. Sta. 781+65 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
416.00	0.00	0.00	0.00	1
416.83	4.10	4.10	0.00	1
417.20	8.20	8.20	0.00	1
417.49	12.31	12.31	0.00	1
417.78	16.41	16.41	0.00	1
418.03	20.51	20.51	0.00	1
418.26	24.61	24.61	0.00	1
418.47	28.71	28.71	0.00	1
418.67	32.82	32.82	0.00	1
418.86	36.57	36.57	0.00	1
419.10	41.02	41.02	0.00	1
438.00	172.84	172.84	0.00	Overtopping

# Rating Curve Plot for Crossing: Crossing 43 downstream

Total Rating Curve  
Crossing: Crossing 43 downstream



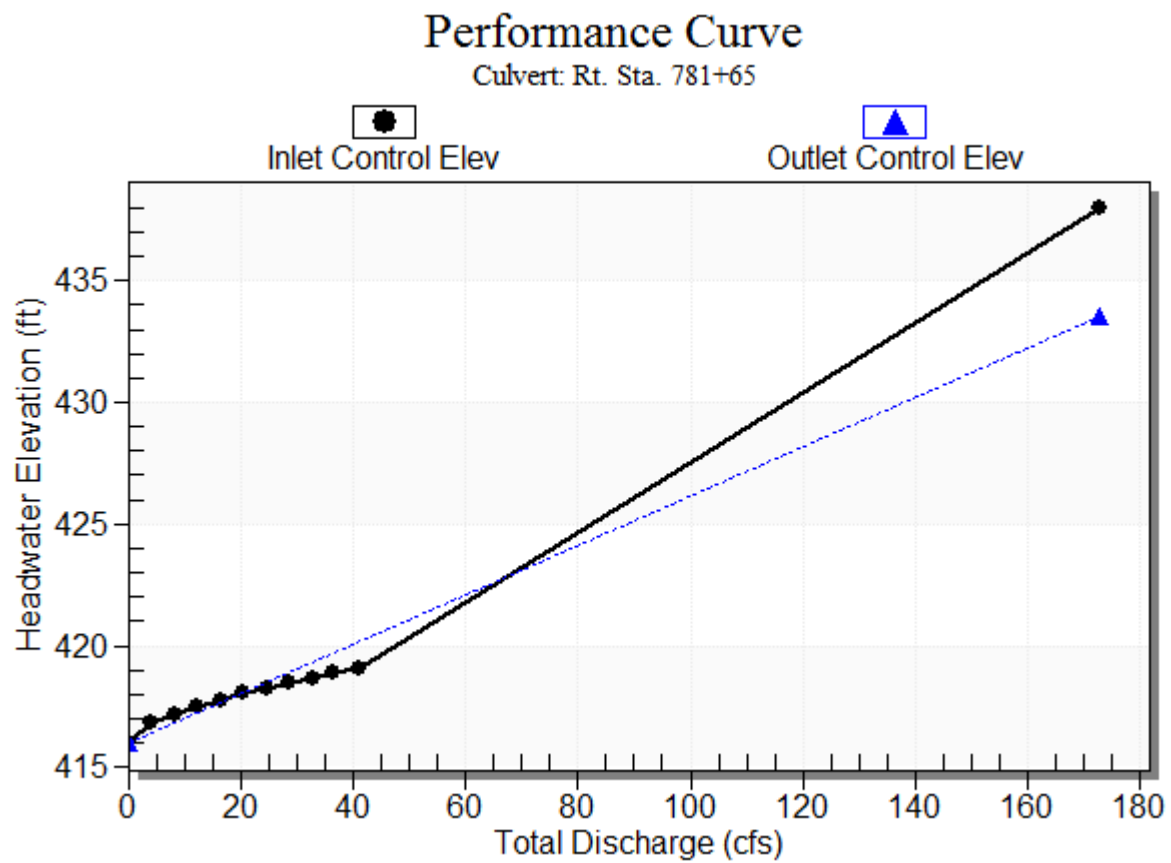
**Table 2 - Culvert Summary Table: Rt. Sta. 781+65**

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	416.00	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
4.10	4.10	416.83	0.831	0.0*	1-S2n	0.347	0.628	0.347	0.225	8.689	8.185
8.20	8.20	417.20	1.199	0.0*	1-S2n	0.506	0.899	0.524	0.340	9.837	10.314
12.31	12.31	417.49	1.491	0.0*	1-S2n	0.618	1.110	0.656	0.432	10.665	11.725
16.41	16.41	417.78	1.777	0.0*	1-S2n	0.715	1.292	0.715	0.510	12.589	12.810
20.51	20.51	418.03	2.028	0.0*	1-S2n	0.812	1.454	0.844	0.580	12.612	13.695
24.61	24.61	418.26	2.255	0.0*	1-S2n	0.887	1.597	0.929	0.644	13.161	14.449
28.71	28.71	418.47	2.467	0.0*	1-S2n	0.960	1.730	1.010	0.703	13.688	15.109
32.82	32.82	418.67	2.673	0.0*	1-S2n	1.033	1.856	1.089	0.758	14.163	15.695
36.57	36.57	418.86	2.863	0.0*	1-S2n	1.098	1.962	1.156	0.805	14.538	16.184
41.02	41.02	419.10	3.095	0.0*	5-S2n	1.165	2.084	1.233	0.859	14.961	16.712

\* Full Flow Headwater elevation is below inlet invert.

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Straight Culvert  
Inlet Elevation (invert): 416.00 ft, Outlet Elevation (invert): 411.91 ft  
Culvert Length: 131.47 ft, Culvert Slope: 0.0311  
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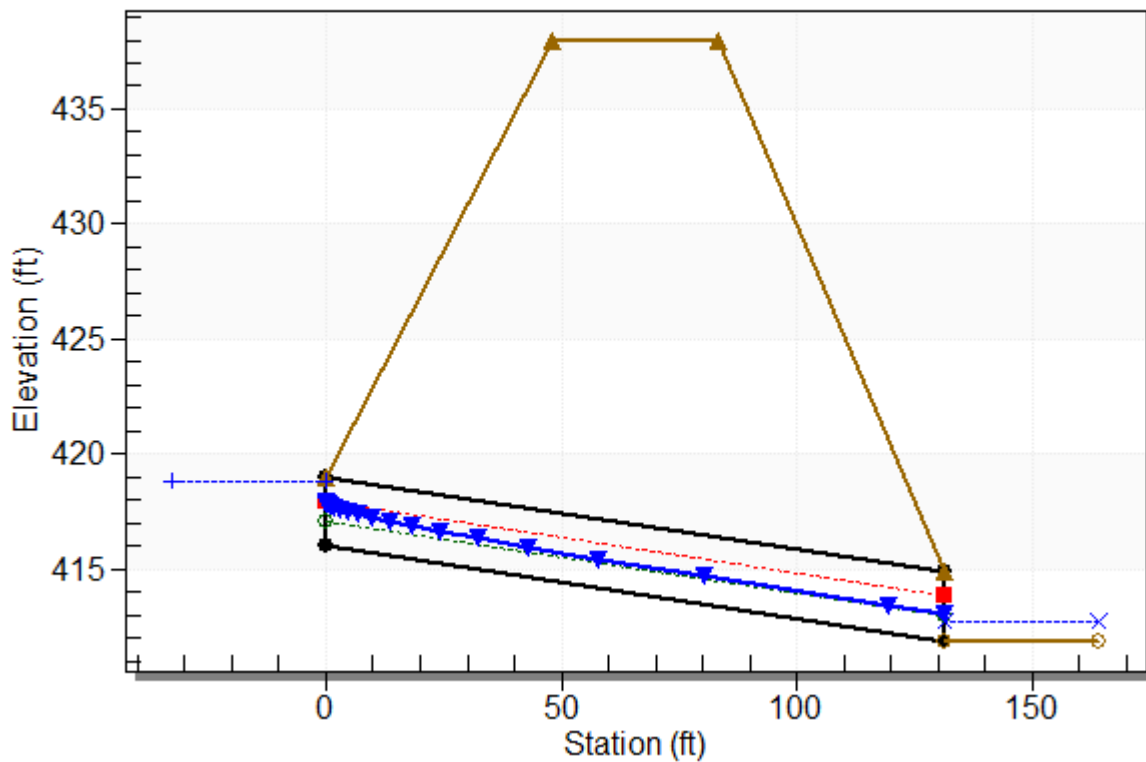
Culvert Performance Curve Plot: Rt. Sta. 781+65



## Water Surface Profile Plot for Culvert: Rt. Sta. 781+65

Crossing - Crossing 43 downstream, Design Discharge - 36.6 cfs

Culvert - Rt. Sta. 781+65, Culvert Discharge - 36.6 cfs



### Site Data - Rt. Sta. 781+65

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 416.00 ft

Outlet Station: 131.41 ft

Outlet Elevation: 411.91 ft

Number of Barrels: 1

### Culvert Data Summary - Rt. Sta. 781+65

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: NONE

**Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 43 downstream)**

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	411.91	0.00	0.00	0.00	0.00
4.10	412.14	0.23	8.19	0.56	3.19
8.20	412.25	0.34	10.31	0.85	3.34
12.31	412.34	0.43	11.72	1.08	3.41
16.41	412.42	0.51	12.81	1.27	3.47
20.51	412.49	0.58	13.69	1.45	3.51
24.61	412.55	0.64	14.45	1.61	3.54
28.71	412.61	0.70	15.11	1.75	3.56
32.82	412.67	0.76	15.70	1.89	3.59
36.57	412.72	0.81	16.18	2.01	3.61
41.02	412.77	0.86	16.71	2.14	3.62

**Tailwater Channel Data - Crossing 43 downstream**

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 1.00 (1:1)

Channel Slope: 0.0400

Channel Manning's n: 0.0120

Channel Invert Elevation: 411.91 ft

**Roadway Data for Crossing: Crossing 43 downstream**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 438.00 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

## **Crossing Discharge Data**

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 36.57 cfs

Maximum Flow: 41.02 cfs

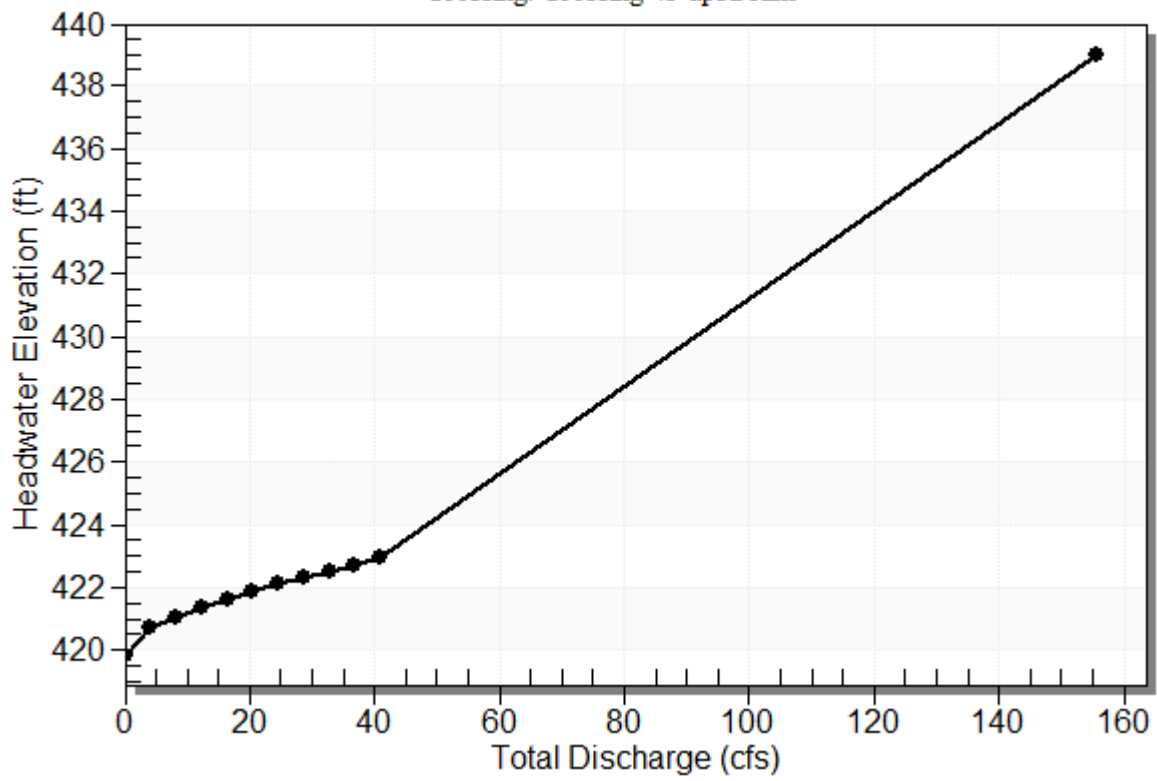
**Table 4 - Summary of Culvert Flows at Crossing: Crossing 43 upstream**

Headwater Elevation (ft)	Total Discharge (cfs)	Rt. Sta. 781+65 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
419.86	0.00	0.00	0.00	1
420.69	4.10	4.10	0.00	1
421.06	8.20	8.20	0.00	1
421.35	12.31	12.31	0.00	1
421.64	16.41	16.41	0.00	1
421.89	20.51	20.51	0.00	1
422.11	24.61	24.61	0.00	1
422.33	28.71	28.71	0.00	1
422.53	32.82	32.82	0.00	1
422.72	36.57	36.57	0.00	1
422.96	41.02	41.02	0.00	1
438.00	155.72	155.72	0.00	Overtopping

**Rating Curve Plot for Crossing: Crossing 43 upstream**

**Total Rating Curve**

Crossing: Crossing 43 upstream



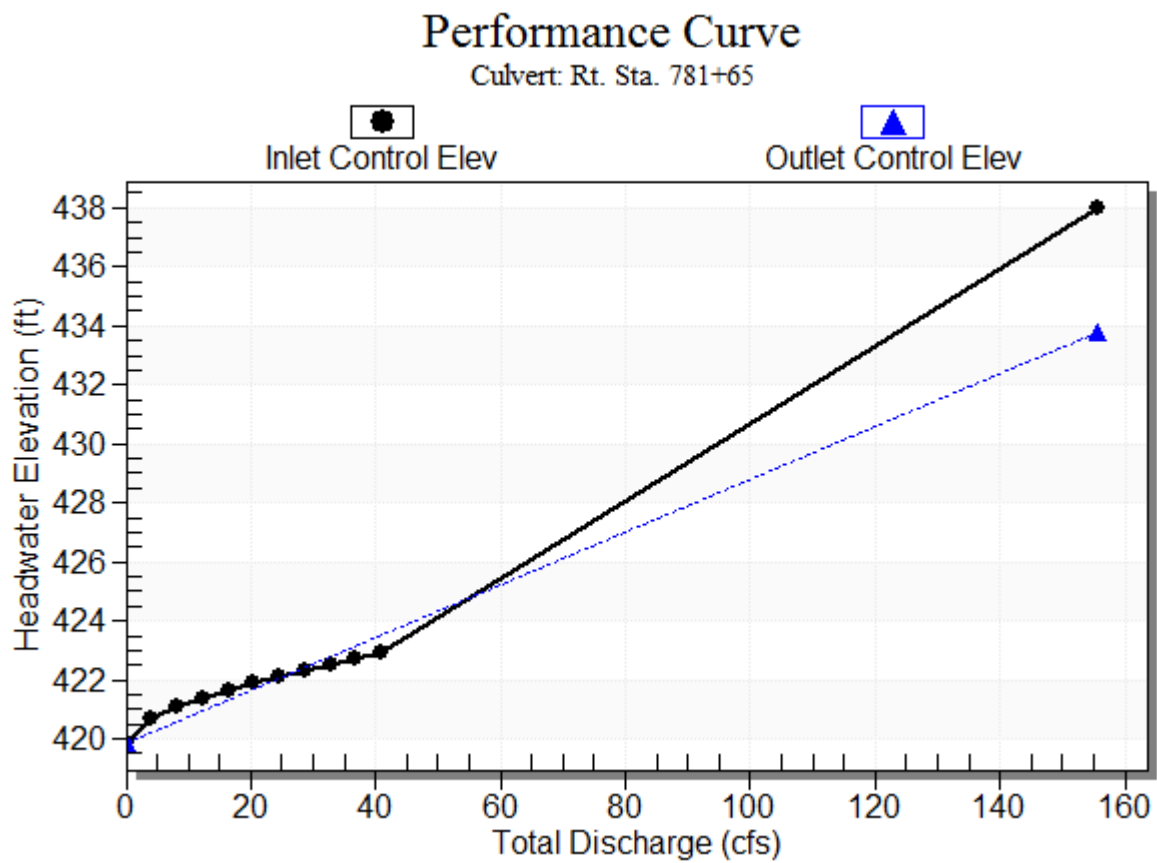
**Table 5 - Culvert Summary Table: Rt. Sta. 781+65**

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	419.86	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
4.10	4.10	420.69	0.831	0.0*	1-S2n	0.347	0.628	0.347	0.823	8.690	0.000
8.20	8.20	421.06	1.199	0.0*	1-S2n	0.506	0.899	0.524	1.198	9.849	0.000
12.31	12.31	421.35	1.491	0.0*	1-S2n	0.618	1.110	0.656	1.491	10.655	0.000
16.41	16.41	421.64	1.777	0.0*	1-S2n	0.715	1.292	0.715	1.772	12.591	0.000
20.51	20.51	421.89	2.028	0.0*	1-S2n	0.812	1.454	0.846	2.032	12.577	0.000
24.61	24.61	422.11	2.255	0.0*	1-S2n	0.886	1.597	0.932	2.240	13.097	0.000
28.71	28.71	422.33	2.467	0.0*	1-S2n	0.960	1.730	1.014	2.240	13.614	0.000
32.82	32.82	422.53	2.673	0.0*	1-S2n	1.033	1.856	1.093	2.240	14.087	0.000
36.57	36.57	422.72	2.863	0.0*	1-S2n	1.098	1.962	1.160	2.240	14.478	0.000
41.02	41.02	422.96	3.095	0.0*	5-S2n	1.165	2.084	1.242	2.240	14.827	0.000

\* Full Flow Headwater elevation is below inlet invert.

\*\*\*\*\*  
Straight Culvert  
Inlet Elevation (invert): 419.86 ft,    Outlet Elevation (invert): 416.00 ft  
Culvert Length: 124.03 ft,    Culvert Slope: 0.0311  
\*\*\*\*\*

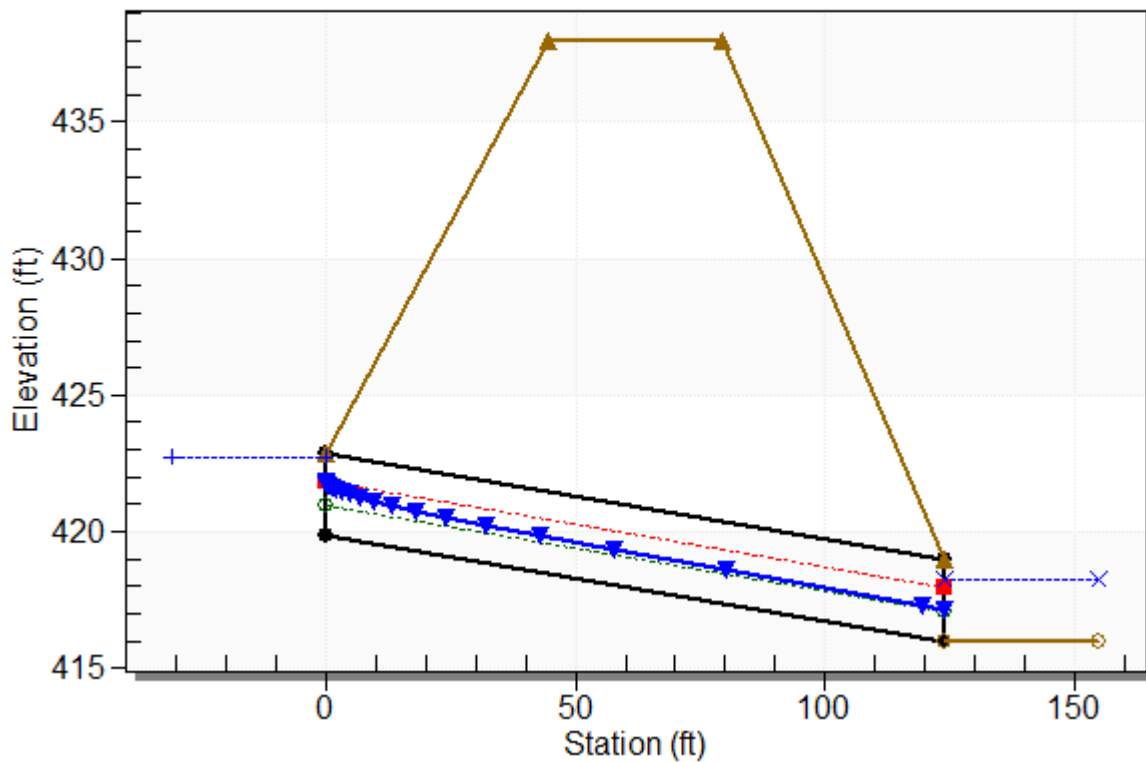
Culvert Performance Curve Plot: Rt. Sta. 781+65



## Water Surface Profile Plot for Culvert: Rt. Sta. 781+65

Crossing - Crossing 43 upstream, Design Discharge - 36.6 cfs

Culvert - Rt. Sta. 781+65, Culvert Discharge - 36.6 cfs



### Site Data - Rt. Sta. 781+65

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 419.86 ft

Outlet Station: 123.97 ft

Outlet Elevation: 416.00 ft

Number of Barrels: 1

### Culvert Data Summary - Rt. Sta. 781+65

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: NONE

**Table 6 - Downstream Channel Rating Curve (Crossing: Crossing 43 upstream)**

[illegible]

[illegible]

[illegible]

### **Tailwater Channel Data - Crossing 43 upstream**

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: 416.00 ft

### **Roadway Data for Crossing: Crossing 43 upstream**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 438.00 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft